(19) Federal Republic of Germany

German Patent and Trade Mark Office

(12) **Unexamined Patent Application**
(10) **DE 198 36 193 A 1**

(51) Int. Cl.[6]:

B 29 C 63/22
B 29 C 65/02
B 60 R 9/05
B 05 D 1/02
B 62 D 37/02
B 29 C 45/16
B 29 C 44/06
// (B62D 35/00, B29K 75 :00)

(21) File no.: 198 36 193.9
(22) Appl. date: 10. 8.98
(43) Publ. date: 2.12.99

(30) Internal priority:
198 23 554.2 27.05.98
198 24 275.1 29.05.98

(71) Applicant:
Fritzmeier Composite GmbH & Co., 83052 Bruckmühl, DE

(74) Representative:

WINTER, BRANDL, FÜRNISS, HÜBNER, RÖSS, KAISER, POLTE, Partnerschaft, 85354 Freising

(72) Inventor:
Fraunhofer, Kurt, 83104 Tuntenhausen, DE;
Kuba, Vladislav, 83109 Großkarolinenfeld, DE

(56) Published documents to be taken into account for the assessment of patentability:
DE 34 39 101 C2
DE 24 61 925 B2
DE 196 34 360 A1
DE 39 03 568 A1
DE 36 42 138 A1
DE 36 23 418 A1
DE 33 38 160 A1
DE 31 40 316 A1
DE 30 28 562 A1
DE 28 24 676 A1
DE-OS 19 22 069
ECKARDT, Helmut: Schaumspritzgießverfahren – Theorie und Praxis. In: Kunststoffberater 1/2/1983, p. 26-32;

The following details are taken from the documents filed by the applicant

(54) Method for applying a surface coating

(57) A method is disclosed for applying a surface coating to a body, in which the surface coating is formed in a separate production step by application of a fluid material. This preform is then pressed with a core.

The invention relates to a method for applying a surface coating to a body according to the preamble of claim 1, and a moulding which is provided with such a surface coating.

Such surface coatings are often used in plastic bodywork parts, in particular wind deflectors of heavy goods vehicles. As these bodywork components decisively characterize the overall impression created by the bodywork of the vehicle, the surface quality has to meet strict requirements.

Two basic methods are known for the production of wind deflectors.

In both methods, a core is firstly prefabricated and coated with glass-fibre materials or other reinforcements and/or inserts. The core itself consists of a foamed material, for example polyurethane. This so-called mummy (core and reinforcement layer) is then inserted into an injection mould and provided with the surface coating.

In the first method, this surface coating consists of a thermosetting plastic, for example a polyester-gel coating, which is injected into the mould before insertion of the mummy. Once the gel coating has cured in the open mould, the mummy is inserted, the mould closed and reaction resin, for example epoxide resin, injected via a mixing/pressing head. The moulding, together with the mummy, the gel coating and the epoxide resin, then cures under pressure and/or heat. The cycle of this method is determined not least by the curing time of the polyester-gel coating. During this time, the mould cannot be used for the actual production process (injection of reaction resin).

Alternatively, a surface coating of thermoplastic can also be used instead of the gel coating. This is a thermoformed film which is prefabricated in its own thermoforming station. As a rule, the thermoforming is carried out by applying a female pressure by which the inserted film, for example an ASA film, is laid against the peripheral wall of the thermoforming mould. A disadvantage of the use of thermoformed films is that a considerable outlay on equipment is required for the thermoforming station. Furthermore, these thermoformed films

can be ordered in predetermined colours only, wherein the manufacturers insist on the purchase of minimum quantities for each colour. A change of colour causes a considerable logistical problem as the films of a colour that is not required must be placed in intermediate storage.

In contrast, the object of the invention is to create a method for applying a surface coating and a moulding provided with such a surface coating in which the surface coating can be applied with minimum outlay on processing and equipment.

This object is achieved in respect of the method by the features of claim 1 and in respect of the moulding by the features of claim 7.

By producing the surface coating as a preform – also called injection skin – by applying, for example painting or injecting a fluid surface material, the outlay on equipment can be substantially reduced compared with the thermoforming method, as no expensive vacuum apparatus is required. Furthermore it is possible to dye the paintable or sprayable surface material in a mixing head to obtain the desired shade, with the result that no intermediate storage for various semi-finished products (films) is required.

A substantial advantage compared with the method described at the outset in which the surface coating was formed by a polyester-gel coating is that the use of release agents in the injection mould can be dispensed with, as the prefabricated preform prevents the epoxide resin from coming into contact with the mould walls.

Furthermore, the cycle time can be substantially reduced compared with the gel-coating method, as the surface coating is introduced into the injection mould in an already at least partly cured state and the cycle is thus determined substantially by the curing of the reaction resin. Alternatively, the preform can itself also be prefabricated in the compression mould.

The preform is pressed with the core in an already cured or at least partly cured state.

By the method according to the invention, an extremely high-quality surface coating is formed which is already the desired shade, with the result that post-processing and even post-varnishing can often be dispensed with.

A plastic, for example a polyurethane, is preferably used as fluid surface material.

The surface quality can be further improved if the auxiliary mould has at least one silicone coating, with the result that no release agent is required for the production of the preform. This version thus makes it possible for the preform, i.e. the surface skin produced by injection or painting or other application, to be inserted into the injection mould without post-processing (removal of the release agent or grinding) and combined with the core.

The auxiliary mould can be formed as a male or female mould. The first-named case can be controlled more easily in production engineering terms, as the skin can be applied more easily to a male body. The use of a female mould has the advantage that the skin can be produced with a better contour fidelity.

The desired shade according to RAL can be set by using three primary colours, with the result that the mixing can be carried out directly in a mixing/injection head and thus a colour change is extremely easy. The method according to the invention is thus very flexible and can also be used for small production runs.

The mouldings produced according to the method of the invention are characterized by an excellent surface quality.

Other advantageous developments of the invention are the subject of the further dependent claims.

The invention is explained in more detail below with reference to schematic drawings. There are shown in:

Fig. 1 a schematic representation of a wind deflector and
Fig. 2 a diagram of the method according to the invention.

The invention is described below using the example of the production of a wind deflector for a heavy goods vehicle. Naturally, the invention can also be used for other components provided with high-quality surface coatings.

Fig. 1 shows a partial cross-section through a wind deflector 1. The latter has a core 2 made of a foamed plastic, for example polyurethane. This core 2 is coated with a reinforcement fabric 4 which can consist for example of glass-fibre or carbon-fibre fabric or another material. The core 2 coated with the reinforcement fabric 4 forms a mummy which, after curing, combines an extremely high strength with a minimal weight. As the surface of the reinforcement fabric 4 does not as a rule satisfy the aesthetic requirements for a wind deflector, the latter is provided with a surface coating 6 which in previously known solutions consisted of an ASA film or a gel coating. In the case of a moulding produced according to the invention, the surface coating 6 consists of an elastomer skin, for example a polyurethane preform, which is joined to the mummy by a reaction resin, for example epoxide resin, polyester resin or PUR resin.

The production of such a wind deflector 1 is explained with reference to Fig. 2.

In a first method step, a preform is produced from a plastic, for example an elastomer material, preferably from polyurethane. This is carried out by injecting or spraying on the polyurethane by means of an injection unit onto an auxiliary mould on which the injected material cures, with the result that an elastic skin is formed from the plastic. The application of the material can naturally also be carried out in another way, for example by spreading on, pouring on or similar. When designing the method according to the invention it

was shown that processing by means of an injection unit is particularly advantageous, as the injection head can be formed with a mixing nozzle via which several differently dyed colour components can be mixed together, with the result that the polyurethane compound can be set to a predefined RAL colour. The setting is possible with a particularly low outlay if every desired shade is set by suitable mixing of three primary colours.

The release of the preform (injection skin) from the auxiliary mould is particularly easy if the latter is provided with a silicone coating or is made completely of silicone. Through this variant, a self-parting mould is practically formed, as the polyurethane coating can be released from the silicone surface very easily without the use of release agents. By dispensing with a release agent, the need to remove it after the demoulding of the preform is also dispensed with, with the result that the method is substantially simplified compared with conventional solutions in which a release agent must be used. In principle, the auxiliary mould can be formed both as a male and female mould. When using a male mould, grained surfaces cannot be produced, as the mould side of the injection skin is directed inwards upon insertion into the injection mould formed as a female mould. However, the advantage is that by forming the outer skin on a male form, visible surfaces with an excellent surface quality can be produced which then form the outer surfaces when inserted into the female injection mould. The post-processing is therefore reduced to a minimum. An advantage when using female moulds is the better contour fidelity of the injection skin.

The thus-produced preforms are either placed in intermediate storage or further processed directly in an injection mould. The preform can be cured, but it is also conceivable that it does not cure completely until it is further processed in the injection mould.

The mummy produced in parallel, which – as described above – consists of the core 2 coated with a reinforcement coating (reinforcement fabric) 4, is inserted into this injection mould. In the case of flat bodies which are to be provided at their periphery with a surface coating 6, two preforms are thus

firstly placed in an upper and lower mould half of the injection mould and the coated mummy then inserted into the lower mould half. The injection mould is then closed and epoxide resin injected into the area between preform and mummy, with the result that an intimate joining of the coating structure (core 2, reinforcement fabric 4, surface coating 6) takes place. The injection mould is naturally provided with ventilation equipment through which the trapped air and excess epoxide resin can escape.

The whole of the surface of the peripheral walls of the injection mould are covered by the preforms, with the result that the epoxide resin cannot come into direct contact with the mould walls. As direct contact of the resin with the peripheral walls of the injection mould is reliably prevented, the demoulding forces for releasing the finished moulding and the wear on the injection mould are reduced to a minimum compared with conventional solutions. Furthermore, the use of release agents can be dispensed with, with the result that the cycle times can be substantially reduced because the application and removal of a release agent are no longer necessary. Furthermore, the logistical outlay is minimal, as a release agent need not be provided at the injection moulds.

After injection of the epoxide resin, the composite cures under the action of heat and pressure, with the result that the wind deflector 1 can be removed from the injection mould. The wind deflector 1 is characterized by an excellent surface quality, wherein the surface coating is already the desired colour and no post-processing whatever, such as for example the removal of release agent or the elimination of surface defects, is necessary. The formation of the moulding by the injection of reaction resin is known in general as the RTM method, with the result that reference can be made to the state of the art for further details.

If particularly high demands are to be met, an additional varnish coating can be applied to the surface coating 6. The outlay is likewise very low in this case as the surface coating 6 is not contaminated with a release agent or other

materials, with the result that a good basis can be made available for the application of the varnish.

In the case of the alternative described above, the capacity of the injection mould can be exploited in optimal manner, as the cycle time is not lengthened by the curing of the surface coating. In industrial-scale production, as a rule several injection moulds are allocated to a central spraying unit, with the result that a just-in-time production is possible and no intermediate storage of the preforms is necessary.

Naturally, other suitable thermosetting or thermoplastic materials can be used instead of the polyurethane to form the surface coating. It is likewise possible to form the preform in one piece, with the result that the upper and lower large surfaces of the mummy are covered by a preform that is for example folded envelope-like, open on one side.

In a simplified variant of the method, the auxiliary mould could be dispensed with and the elastomer surface coating inserted directly into the mould for compression/curing of the moulding. Although the outlay on equipment would be lower in this case, the cycle time of the compression mould would be longer than with the procedure described above. In principle, any suitable plastic can be used to form the preform.

A method is disclosed for the application of a surface coating to a body, in which the surface coating is formed in a separate processing step by applying a fluid material to an auxiliary mould. This preform is then pressed with a core.

Claims

1. Method for applying a surface coating (6) to a body (2, 4), with the steps:
   - producing a core (2, 4),
   - introducing a surface coating (6) into a mould,
   - placing the core (2, 4) into the mould and
   - closing the mould and curing the moulding under the action of pressure and/or heat,

   characterized in that the surface coating (6) is prefabricated as a preform by application, preferably spraying-on, of a surface material.

2. Method according to claim 1, characterized in that the surface material is a plastic, preferably polyurethane.

3. Method according to claim 1 or 2, characterized in that the preform is prefabricated in an auxiliary mould.

4. Method according to claim 3, characterized in that the auxiliary mould is a silicone mould or silicone-coated auxiliary mould.

5. Method according to claim 3 or 4, characterized in that the auxiliary mould is formed as a male or female mould.

6. Method according to one of claims 1 to 5, characterized in that the preform is at least partly cured before being joined to the core (2, 4).

7. Method according to one of claims 1 to 6, characterized in that before application the surface material is dyed to the desired shade of the surface coating.

8. Method according to claim 7, characterized in that the dying takes place with three primary colours.

9. Moulding, in particular a wind deflector produced according to the method according to one of the previous claims, with a core and a prefabricated surface coating made of an elastomer, preferably a PU material.

DRAWINGS PAGE 1

Number: **DE 198 36 193 A1**
Int. Cl.[6]: **B 29 C 63/22**
Date laid open
for public inspection: 2nd December 1999

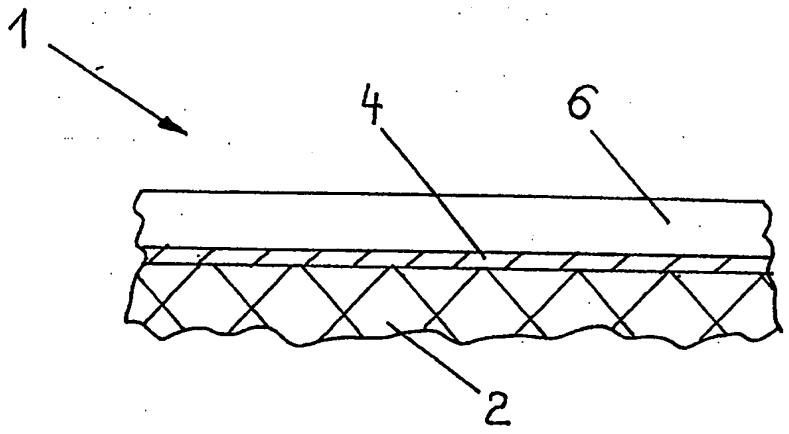

Fig. 1

Number: **DE 198 36 193 A1**
Int. Cl.[6]: **B 29 C 63/22**
Date laid open
for public inspection: 2nd December 1999

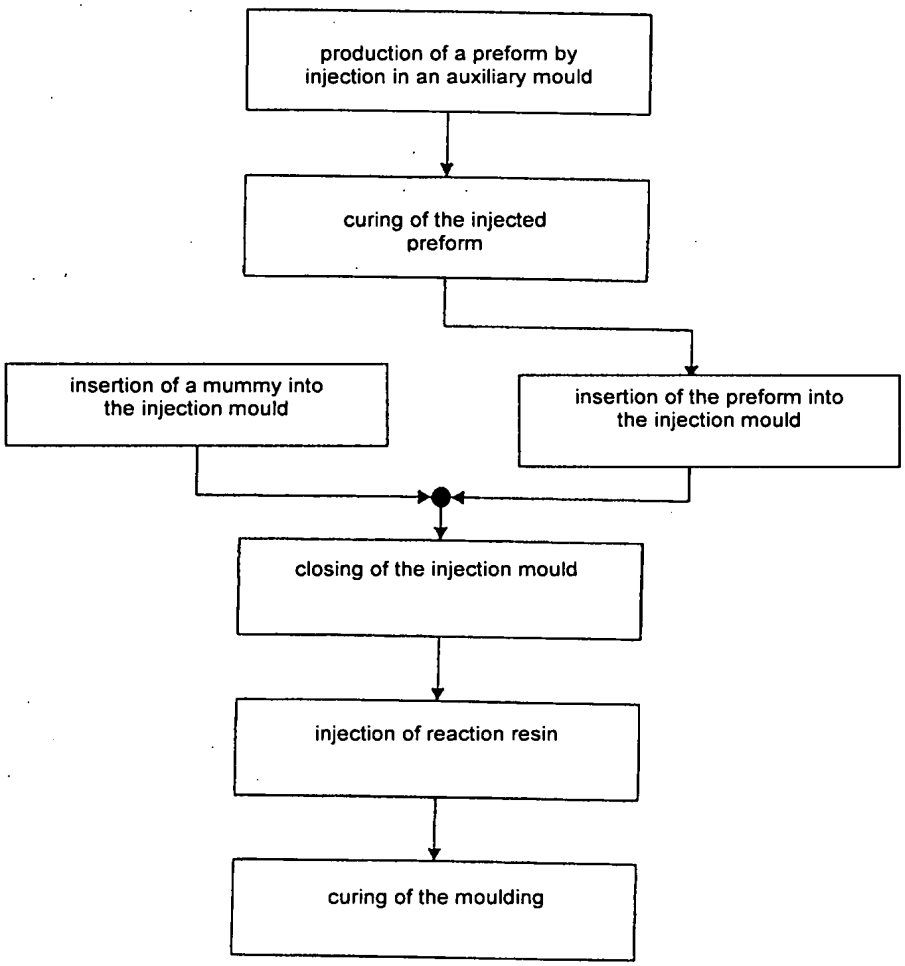

Fig. 2